

Geophysics 150: Home set due Oct. 07, 2002

5. We are now ready to compute temperature within the present Ceres. Use data from question 1.

a. Calibrate the current radioactive heat generation starting with the Earth. About 0.060 W m^{-2} heat flow globally is associated with crust and mantle radioactivity on the Earth. Assume that Ceres has the same radioactive heat generation per mass as the Earth and obtain the surface heat flow on Ceres assuming steady state.

b. At present the surface temperature on Ceres is 150 K. We want to find the depth to the clement zone where the temperature is between 273 K and 373 K. Let the conductivity be $1.5 \text{ W m}^{-1} \text{ K}^{-1}$, which is ok for rock with cracks and alteration. Find the depth range assuming heat flow is constant with depth.

c. Are your computed depths a significant fraction of the planetary radius? Compute the heat flow at these the depths treating Ceres as a homogeneous sphere.